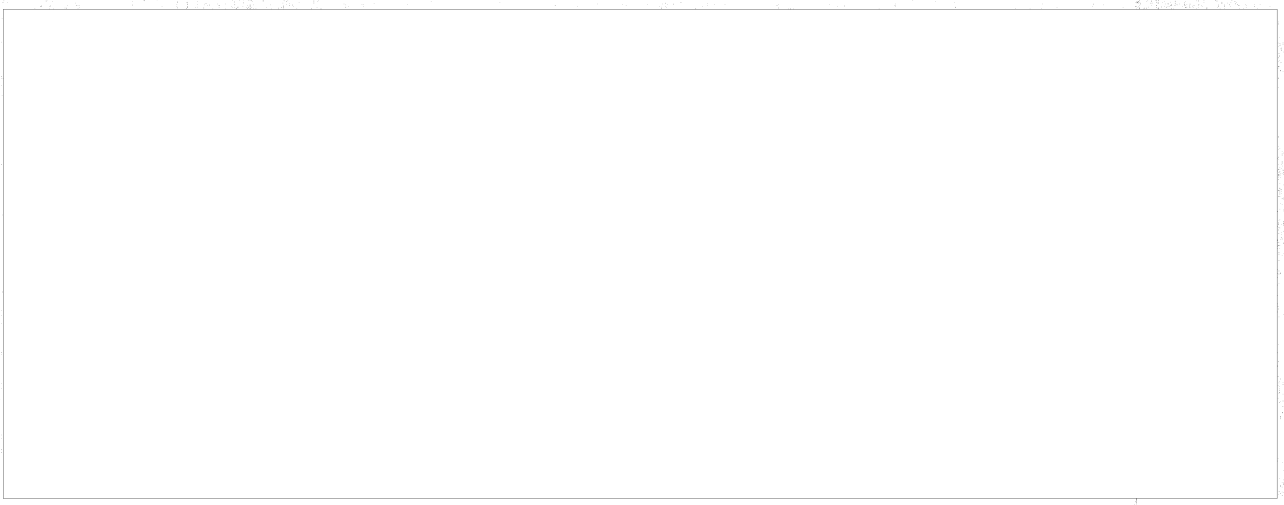

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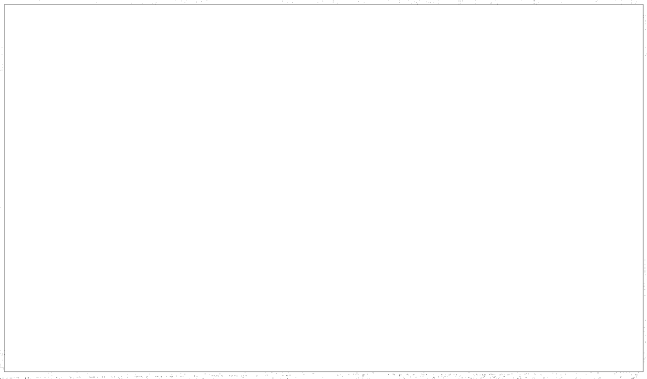
Iron Ore Deposits of the Soviet Union in Europe and Asia and the Relation of Its Metallurgical Industry to Iron Ore Reserves

Die Eisenerzvorraete der Welt, by Dr. Gustav Einecke, Duesseldorf, 1950



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C. THE DEPOSITS OF THE SOVIET UNION IN EUROPE AND ASIA AND THE RELATION OF ITS METALLURGICAL INDUSTRY TO ITS IRON ORE RESERVES

(Atlas, pages 44 to 46)

The huge empire of the Soviet Union, which is forty-five times larger than pre-war Germany, contains a numerically larger amount of known [Iron] deposits of all kinds than any other compact state.

Furthermore, there exists the possibility of discovering and opening up many more deposits in the large unexplored areas of [young] mountain formations east of the Urals. In accordance with the then modest needs of the population the industry of the tsarist period was on a small scale. Immediately after World War I, however, the government of the Soviet Union began to strive for an industrial autarky in all fields of economic life and tried to achieve this goal by means of their five-year plans. This development was in full stride when the empire under construction was hit by World War II with an impact that will for a long time prevent the realization of the previously fixed autarkic goal. The inadequacy of inland waterway, sea, rail and truck transportation, the deficiency of fuel and electric-power production; the need for development of a heavy industry for all planned construction, the poor quality of the products and the superficial retraining of farmers for industrial work are the main weaknesses which must be overcome by the Soviet Union before it can grow into a great industrial power and become a serious competitor in the world markets.

The fourth Five-Year Plan anticipates a pig iron production of 50 to 60 million tons and an iron ore yield of 100 to ~~250~~ 120 million tons, the same as reached by the United States in 1943. We shall try to clarify in the following explanations whether or not the size of the reserves will permit the mining of such a large quantity of ore after

the previously mentioned difficulties have been overcome.

The iron ore deposits of the Soviet Union can be divided, according to their location, into five groups in European Russia and into four groups in Asiatic Russia:

1. EUROPEAN RUSSIA (Atlas, pages 44 to 47)

a. Northern Russia

On the Baltic shield which extends through the whole of Finland and reaches the Russian side in an open arc from Lake Ladoga northward to the Gulf of Archangel, are located the former Finnish mines of Pitkäranta, Vilimaki, Kelivaara and Tulmosero, which are classed as skarn formations; this is true also of the old Russian deposits near Pudoshgorsk east of Lake Onega, Olonogorsk, Michykov and the Enskly deposit on the Kola peninsula. Magnetite and hematite are found here which require elaborate preparation prior to smelting, and resemble in character mostly the ore of the itabirite deposits on the old shields (Tables 60, 61, and 174, number 19).

[Table 60]

b. Moscow Basin

The second group is situated in the Moscow Basin which borders in the south on the archaic part of the Baltic Shield. The lower stratum is composed of carbonic layers covered by a Mesozoic coat. The mines around Tula, Ryazan, Orel, Lipezk and Kursk belong in this Paleozoic Basin.

We are concerned here with metasomatic transformation and "filling-outs" in carbon limestone (Lipetsk, Tula, Ryazan', Vladimir and Kaluga) as well as with sedimentary formations in Jurassic clays (Orel, Vladimir, Ryazan'). Sporadic formations in Jurassic limestones have also been found here. In Kursk ferriferous quartzes are found under the metasomatic and Jurassic formations, being the oldest transformations of the Baltic Shield.

c. Ural Foreland

The third group is located in the wide Perm region of the Ural foreland, namely in parts of the Gubernskiya of Vyatka, Vologda and Perm and contains only clayey siderites (Sphaerosiderite) over Permian carboniferous limestones (Table 60).

/Table 61/

d. Urals

The next iron ore group is in the Urals, at the eastern edge of the Russian ~~as well as of~~ the European plateau, which was raised high through folding during the Permian period and which was worn away from from the beginning of the Tertiary period to its present much lower level. The brown iron ores, the argillaceous iron ores and the sphaerosiderites found here are attached to the piled up paleozoic layers of the Devonian and the Carboniferous periods. The bottom stones of the uncovered archaic layer constituting the core of the mountain range, on the other hand, exhibit contact pneumatolitic magnetites and red iron ores with a high iron content. There were over 300 installations in the Urals

at the time of World War I. Because of the widespread location of the iron ore beds the smelting plants are also distributed all over the Urals. Therefore, no real iron industry centers, as understood in Western Europe, exist in the Urals, the ore as well as the coal deposits in the carboniferous belt of the western slope of the Urals do not provide coke suitable for blast furnace operations. The larger mining districts are shown in the Atlas Supplement on page 45. A small part of the iron ore deposits of the Urals differs from all the other mines of the Soviet Union in that their ores can be used for manufacturing pig iron and steel products containing nickel, chrome, and vanadium without any special addition. The most important mines of this group are Bogoslovsk, Bakal, Magnitnaya-Gora (Table 62).

c. Southern Russia and the Crimea

The last group of the Russo-European deposits are those of Southern Russia and the Crimea. Today these are economically the most important ore deposits of Russia and the only Russian deposits of world-wide importance, namely those of Krivoy Rog in the Ukraine and the mines on the Kerch' peninsula (Atlas, pages 46 and 47).

Apart from its agriculture and its pit coal deposits, the great value of the Ukraine is to be found in the large quantities of iron ores and manganese ores. Even in old Russia, the Russian iron and manganese industry was centered in the Ukraine; in 1913 more than 70 percent of the pig iron ~~blasted~~ in Russia (4.3 million tons) was produced from Ukrainian iron ores. The ore wealth of the Ukraine is identified with three names: Krivoy Rog, Kerch' and Nikopol' (manganese).

The iron ore region of Krivoy Rog runs north-northeast by south-southwest in a 90 kilometer long and 3 to 6 kilometer wide syncline along the rivers Ingulets, Saksagan' and Sheltaya (Atlas page 47), and is the most valuable of these three deposits. A large number of rich ore ~~measures~~ beds and ore ~~lumps~~ bodies having a length of 100 to 500 meters and containing magnetite, red iron ore and brown iron ore, are found in a 50 meter thick old Algonkian horizon of iron containing banded hornstone and iron jaspilit, which contains 40 percent iron on the average. The deposit is especially noted for its rich ore ~~lumps~~ bodies, which are easily extracted.

The most important ore types of Krivoy Rog are:

1. Magnetite ores, about 3 percent of the deposit, with 55 percent to 70 percent Fe.

2. Martite ores, about 64 percent of the deposit, with 64 percent Fe.

3. Red iron ores about 31 percent of the deposit, with 48 to 55 percent Fe.

4. Limonite, about 2 percent of the deposit, with 33 to 60 percent Fe and high manganese content.

[Table 62]

The reserves are variously estimated. Some reports speak of early exhaustion of the high-grade parts of the deposit, others of a total of 300 million tons, whereas still others speak of unlimited quantities. The last estimate probably includes the bottom layer of

quartzite, containing 30 percent Fe, which has been ascertained to amount to 10.5 billion tons to a depth of 210 meters and estimated to amount to a total of 40 billion tons to a depth of 500 meters.

[Table 63]

The most recent data based on averages have been used for Table 64.

[Table 64]

The pre-war output fluctuated between 4 to 6 million tons. Production decreased to 170,000 tons when the Soviet Government came into power, but only to rise very quickly to a fourfold of the pre-war production. The export port of Nikolayev is, by air, at a distance of only 150 kilometers and can be reached by six different railway lines having a length of 220 to 230 kilometers.

The ore region of Kerch' on the Crimean peninsula does not belong to the Ukraine proper, but attention must be called to it here because of its economic connection with the Ukrainian ore territory. It carries porous decayed oölitic brown iron ores which are interspersed with clayey intermediate layers and solid seams of rough ores containing manganese. Table 65 gives details regarding the iron content and the reserves of the Kerch' region.

[Table 65]

The ore mass of the peninsula lies under a layer of rubble 4 to 5 meters thick. Its arsenic content and its high humidity together with its ochreous character have, until now, hindered large-scale exploitation of this vast deposit. Now that sintering is carried out before smelting it is probable that the arsenic content can be practically eliminated. The construction of such a plant and the enlargement of the Thomas Plant in the metallurgical works of Kerch' have markedly bettered the output of the mines. In 1938, the output already amounted to 6,500,000 tons. The plan for increasing the output of the Krivoy Rog and Kerch' mines to 20 million tons and for the adequate enlargement of the sintering plant is probably already completed.

By 1960 the output of the Crimean Peninsula should be raised to 60 million tons. By that time, the output of the entire Union should reach 100 million tons. On the Peninsula the larger deposits noted in Table 65 will be worked more intensively for this purpose and the deposits of Kursk and Krivoy Rog will be further developed. The iron output will correspond to the average given in Tables 63 and 65.

Finally to be mentioned is the manganese ore deposit at Nikopol' on the right bank of the Dnepr, the largest manganese ore deposit of Europe. This is one of the most important mineral resources of the Ukraine and is closely connected with its iron industry. Here the reserves amount to about 500 million tons, including the deposit at Alexandrovka situated northwest of Nikopol'. The production capacity of the plant reaches 1 million tons annually. The manganese ore reserves of Soviet Russia are distributed among the main deposits as follows:

Chiatura (Georgia)	162.7 million tons
Nikopol' (Ukraine)	491.0 million tons
Labinskiy (North Caucasus)	32.9 million tons
Mangyshlak (Kazakhstan)	32.7 million tons
Other deposits	28.0 million tons
Total	747.3 million tons

2. ASIATIC RUSSIA (Atlas, page 48)

As a glance at page 48 of the Atlas will show, the iron ore deposits of Asiatic Russia are concentrated in four areas. Large deposits, such as those found in European Russia at Krivoy Rog, Kerch' and Kursk are not found among them. The known iron ore deposits are all located in the immediate vicinity of the great Trans-Siberian communication line, and besides this, in the mountains of Kazakhstan, in Western and Southern Siberia and in the Far East where they can be uncovered by relatively simple methods. Realizing the inadequacy of these reserves for a large-scale development of = heavy industry in Siberia and the Far East, the Soviet Government has appointed an army of scientifically trained geologists -- 12,000 persons, according to pertinent literature -- for a field survey of mineral resources, with the task of examining the several hundred known iron ore deposits in Siberia as to their extent and as to the quality of the ores, and also of investigating the still unexplored central and the wide northern part of the country. Judging by the small-scale investigations conducted during the last decade, the results will probably justify this extensive assignment of scientists. Taken separately, the following may be said of these four groups:

a. Kazakhstan

In Kazakhstan, ~~but~~ especially in the part of Central Asia adjoining it on the south, very few iron ore deposits have been found in spite of its large expanse, in contrast to its numerous ~~nettled~~ ore and coal deposits. To be mentioned are the deposits near Karaganda, Karkaralinsk, Kentyube, Atasu and Kardsakpay (ferriferous quartzite) which, excepting ferriferous quartzites, contain a total of 100 million tons of ore. No iron ore deposits of value have been found in Central Asia. Literature relating to these two regions indicates, however, that the number of the iron ore deposits has been increased by the latest surveys and that, even in Central Asia, iron ore deposits of noteworthy size have been found.

/Table 66/

b. Western Siberia

The locating of deposits in Western Siberia is rendered more difficult by the thickness of the superposed Tertiary and Quaternary layers which, in addition, sink in toward the north. In the approaches to the ~~Zanye~~ Sayan Mountains, a part of the piled up southern marginal mountain ranges, and in the mountains themselves the deposits increase in number. ~~Here belong~~ These deposits include the Tel'bes, Kondoma, Tashelga and Teya groups, which are ~~marked~~ intended in the first place to supply the blast furnaces of Kuznetsk and which contain, including the possible reserves, roughly 255 million tons of ore (Table 66). These groups in the south of Western Siberia find their immediate continuation beyond the east Siberian border.

/Table 66a/

c. Eastern Siberia

In the central and northern parts of Eastern Siberia, also, the work of the field geologists in opening up iron ore deposits had to be done under conditions which were not too favorable. The northern and central parts of Eastern Siberia form the Eastern Siberian platform which is composed of Paleozoic and Mesozoic rocks resting on a crystalline, creased Cambrian shield (called "summit" in Russia). Similar phenomena are recognized in other countries such as Sweden, Norway and India, and also in Krivoy Rog and the Russian Far East, as the basis for the formation of large ore deposits (see Table 174, number 19). It is impossible to gain knowledge regarding the substratum of the layers covered by the Mesozoic without extensive boring operations. This, however, is very difficult owing to the impracticable, often marshy terrain, where boring can be accomplished only at very high costs and with great difficulties. Intrusive and extrusive rocks forced up into crevices and Silurian traps are found in unusual number on the platform. Their appearance gives some indication as to the presence of iron ore deposits. The Siberian platform is surrounded on the southwest, south and southeast by the main range of the Yenisey ~~mounta~~ mountains, the Vostochnyy Sayany Mountains, western and eastern Transbaykal and finally by the mountainous Lena-~~Vitim-Aldan country~~. These mountain ranges with their advanced tectonic disjunction and extensive granite intrusion are the sites of ~~the~~ very numerous deposits of transformed or hydrothermal magnetites and hematites recognized today. Apart from these are the limonite deposits of Ol'khonskiy and the transformed sedimentary ore deposits of the Onon region.

The following ore regions can be distinguished in Eastern Siberia (Atlas, page 48):

1. The Minusinsk basin on the right bank of the Yenisey. Reserves: less than 1 million tons.

2. The territory between Krasnoyarsk and Kansk. Reserves: less than 1 million tons.

3. The Angara-Ilim region on the middle course of the Angara and its tributary the Ilim. Reserves: 192 million tons.

4. The Onon region west of Irkutsk on the Lower Onon. Reserves: 100 million tons.

5. The Ol'khonsk region on the western shore of Lake Baykal. Reserves: more than 0.25 million tons.

6. The Mysovsk region south of the railway station of the same name on Lake Baykal. Reserves: more than 0.5 million tons.

7. The Verkhne-Udinsk region on the rivers Selenga and Chikoy. Reserves: 3.5 million tons.

8. The Kurba region on the River Kurba north of the city of Verkhne-Udinsk. Reserves: 100 million tons.

9. The Orkhon region on the left bank of the Orkhon River near the northern Chinese border. Reserves: 127 million tons.

10. Siderite sediments and disintegrating deposits in East Transbaykal near Berezovky on the Iron Mountain and near Yakovlensk and Bystrinsk. Reserves: more than 300 million tons.

The current numbers of the above mentioned deposit regions are listed in the Atlas on page 48. Besides these deposits, there are found sporadic and not yet explored deposits of iron ores. The very

disturbed structure of the ore carrying regions results in a highly varied formation of the iron ore deposits. From the scant literature available it can be ascertained that Eastern Siberia can produce all the genetically basic kinds of iron ore deposits which science distinguishes today. In Tables 66 and 66a, an attempt has been made to show, as far as possible, the character of the ore and its composition. The total quantity of certain, possible, and probable ores in Eastern Siberia amounts to more than 700 million tons.

d. The Far East

In the Far East the geological conditions of the deposits are still little known or published. The deposits occur mainly in the pre-Cambrian folded substructure of the old shield and in a few related horizons. The majority of the deposits listed on page 48 of the Atlas contain ferriferous quartzites or transformations derived from these. The largest known deposit in Asiatic Russia is a ferriferous quartzite bed in the Little Khingan with more than 650 million tons and having the same itabiritic construction as that near Anshan in Manchuria (Table 17b).

3. THE RESERVES OF THE SOVIET UNION

Even before World War I the mining statistics of Russia were kept confidential. As early as 1910, at the 11th Geological Congress at Stockholm, the known iron ore reserves of Russia were stated at the very low figure of 2.06 billion tons. The figures regarding reserves nowadays gleaned from Russian publications must also be considered as stating the very minimum quantity of iron ores. Let us compare these with the unusually large coal reserves which were made known at the Geological

Congress in Moscow in 1938. In 1913, Russia calculated on 234 billion tons. By 1938, the Soviet Union was already able to exhibit 1654 billion tons of pit coal and brown coal. According to the latest research, this amount has been substantially increased. In 1913, Russia's share in the world coal reserves was 3.2 percent. In 1938, the Soviet Union was able to claim 21 percent of the world reserves, with pit coal exceeding 30 percent. Today the Soviet Union is already the second richest coal-possessing country of the world and a serious competitor for the first place.

The location and reserves of the most important coal deposits are:

	Billions of Tons
Donets Basin	88
Moscow region	12
Urals	more than 30
Kuznetsk Basin	450
Karaganda region and Central Asia	52
Pechora	60
Minusinsk	29
Irtysh [illegible] Barnaul Basin	83 26 40
Baykal Basin	838
Tungus Basin and Yenisey	40
Kansk-Achinsk Basin	

Besides these, there are 30 more or less large known deposits. The total of the pit coal and brown coal reserves, to a depth of 1,600 meters, is estimated, as previously mentioned, at more than 1,600 billion tons. A great part of the coal of the Tungus Basin may be considered as possible reserves.

It does not necessarily follow that the exploration of the whole country for iron ores in recent decades will yield the same results as in the case of pit coal; however, as shown by the maps on pages 44 to 46 of the Atlas, a number of new deposits which were unknown a decade ago, have been discovered and it can be expected that the new mass assignment of field geologists will open up more than have been published in the domestic and foreign literature. The following reserve-prospecting results must be evaluated with this in mind. The reserves discovered up to 1935 are shown in Table 67, in which the figures for the European and Asiatic territories of the Soviet Union are shown separately, and which are, in turn, broken down into major iron ore regions.

/Table 67/

The picture of the enormous amount of iron ore deposits in the Soviet Union would not be complete without mentioning the huge deposits of ferriferous quartzite in Russia. These deposits amount to a total of 256 billion tons, of which 11.7 billion tons are certain and probable, and are distributed over the individual regions of the Union as noted in Table 68 (in millions of tons) :

/Table 68/

The reserves of the entire Soviet Union as given in Tables 67 and 68 are stated to be the results of geological research and prospecting up to 1935. In the years 1935-1937 alone, these reserves increased by approximately 1.4 billion tons. Since January 1, 1938, the

amount of reserves of the formerly known deposits has increased and new deposits have been added in different parts of the Soviet Union. It will probably be a long time before the results of this new exploration will be worked up and, perhaps, be published. It is certain that the total amount of reserves of 13.3 billion tons (Table 67) and the certain and probable reserves of ferriferous quartzite of 11.7 billion tons (Table 68) have increased considerably. In the Urals region alone, large reserves have been found in the last decade owing to thorough geological exploration and prospecting. As already mentioned, the latest discoveries in Kazakhstan and Russian Central Asia are even more important. However, accurate figures are still lacking. In view of these facts, half of the 8.9 billion tons of possible reserves shown in Table 67 have been transferred to the probable quantities, whereas a quarter of the 11.7 billion tons of the visible and probable reserves shown in Table 68, which have been considered as not worth mining, should be included in the probable reserves worth mining, because their iron content is not lower than that of many reserves mentioned in Tables 60 and 67. The reason why they have not yet been mined and worked up is because the necessary blast furnaces do not yet exist or are still under construction. They lie on the border line of deposits worth mining.

The picture of the reserves of the entire Soviet Russia is now modified in the final amounts as given in Tables 67 and 68, as follows:

Total Reserves of the Soviet Union
(millions of tons)

	Proved and Probable Reserves	Possible Reserves	Total Reserves
Ores (excluding iron quartzite)	8,819	4,456	13,275
Iron quartzite	3,896	252,583	256,479
	12,715	257,039	269,754

These are the figures given for both parts of Russia in world reserves (Table 1).

4. ANOMALIES IN EUROPEAN AND ASIATIC RUSSIA

Besides the regular iron ore deposits and the ferriferous quartzites which were included in the above stock-taking of iron ore, there is in the Soviet Union another group of deposits, the existence of which is presumed on the basis of geophysical analyses and which, except for a part of the Kursk Anomaly, have not been included in the possible reserves, but can become of great importance; thus, no true picture of the reserves of the Soviet Union can be obtained if they are disregarded. These are the much discussed anomalies:

The examination of the Magnetic Anomaly of Kursk is not yet completed. Numerous magnetic anomalies have been established in the pre-Cambrian block, covered by chalk and Jurassic layers, of Voronezh on the southern edge of the Moscow Basin. The best known among these is that of Kursk, which points to ore deposits similar to those found in several parts of the old stable shields and equal in quality and thickness to those drilled, for example, in Krivoy Rog. On the other hand, the existence of enormous reserves is doubted by some inasmuch as sufficient proof has not yet been furnished. According to von Bubnoff, who bases his statement on research conducted by Professors Arkhangel'skiy and Kurbatov, the economic prospect is considered ~~as~~ poor. According to him, the quantity of the ascertained ore amounts, up to a depth of 500 meters, to a possible reserve of 300 million tons with an iron content of 30 to 40 percent. On the other hand, Professor Gubkin, member of the Academy of Sciences, states that although the first bore holes show only ores poor in iron, such as the ore rich in silica found in Krivoy Rog, later bore holes have, supposedly, shown ~~blocks~~ ore beds 8 to 22 meters thick

with 60 percent and more of iron at only 110 meters below the sufase, and of a quality equaling the best Krivoy Rog ores. He estimates poor and high grade ores to ether at 200 billion tons.

In the southern part of the Soviet Union, alse, a group of new magnetic anomalies has been established by geophysical measurements east of Krivoy Rog in the direction of the Donbas; from which a considerable increase in the ore reserves of the Ukraine is expected. Until now, borings have shown iron ore of the Krivoy Rog quartzite variety. The Kremenchug Anomaly alone extends over an area of 210 kilometers. Smaller anomalies are located near Verkhovtsevo, on the Konyvka, and farther north near Slavgorod, and finally on the Sea of Azov. Numerical data on these are not at hand.

5. PRODUCTION IN THE SOVIET UNION

The total reserves of the Union present a highly impressive picture in spite of all uncertainties, because in European Russia alone the tonnage exceeds that of any other country in the world, even if one takes into account only the Kursk Anomaly as regards iron quartzites. The quick and full exploitation of the ores is hindered by two factors. First, as indicated in Table 62, a great part of the ores in the more important deposits has to be crushed, separated, briquetted or sintered before smelting. The ores in the regions of Tula, Lipetsk and Chopar in Central Russia, a great part of the ores in Northern Russia, all the ores of the Kerch' region, a great part of the Ural ores, almost all the ores in Western Siberia, and part of the ores of East Siberia and the Far East have to be concentrated. The problem almost everywhere is the

difficult process of preparation, for the solution of which foreign countries have gathered much experience by painstaking work. Furthermore, the mining of many deposits now being worked will be discontinued as soon as the last Five-Year program of the Soviet Union is completed and the necessity for increased agricultural work is felt.

The second weak point in the exploitation of many iron ore deposits is, as already repeatedly intimated, the extent of the Russian-Siberian expanse and the lack of railways as well as the limited transportation possibilities on the existing tracks. The shipping of coal to the ore, or vice versa, remains, even with the greatest expansion of the railway net, time-consuming and expensive, thus raising considerably the price of coal, or ore at the smelting plant. The Siberian railway net is being expanded on a large scale. The largest project, which should be accomplished by 1950, is the laying of a second connecting track toward Southern Siberia and the Far East. It begins in the region of Kuybyshev and runs through the Urals in an eastward direction through Magnitogorsk toward Barnaul and from there toward the northeast, where it links up with the existing Siberian railway. This track should be about 4000 kilometers long and, make accessible, besides the coal fields of Kuznetsk, the numerous coal and iron ore deposits lying along the railway line. This new railway will promote the development of a large-scale iron industry beyond the Urals and create wide marketing possibilities for a flourishing agriculture.

At the end of the Second Five-Year Plan 70 to 75 percent of the pig iron production has been concentrated in Southern Russia because of the vicinity of the world-renowned iron ore deposits of Krivoy Rog and

the important mines at Magnitnaya Gora in the Southern Urals. To relieve these industrial regions, there has been developed in the last decade, a separate heavy industry in the center of the country, especially in the Moscow Basin, where ore and coal lie in fairly close proximity. The reason for the transfer of part of the heavy industry and the opening of new deposits is supposed to lie also in the fear that the supplies of high-grade ore in Krivoy Rog would not last for many more decades, and also that many small iron works in the Urals will be provided with high-grade ore for only a short time. It is also endeavored to render the Leningrad industrial region in northern Russia more independent of the southern part of the country. The ore deposits of Kola and Gam with more than 100 million tons of average quality ore, as well as those of Lakes Onega and Imandra and the former Finnish deposits on Lake Ladoga are of importance for this purpose. Moreover, there exists a plan for the construction of a number of large metallurgical plants near Magnitogorsk, Novo-Tagilsk, Khalilovo and Bakal, and near Kuznetsk, Bratsk, Balyagynsk, and Petrossko and others in the Far East (Table 65).

Of especially great importance for the existing part of the Kuznetsk metallurgical plant in Western Siberia, which is in the future supposed to cover 50 percent of the great overall needs of the Soviet Union, are the hematite and magnetite mines located 100 kilometers to the south and southeast. The deposits of the Tel'bes, Kondoma, Tashtagol, and Teya group in Western Siberia are to be mined first; later, as soon as connection with the Siberian railway is completed, mining will move on to the East Siberian deposits near Abakansk, Minusinsk and Irkutsk. The ores available there amount to 425 million tons. The planned yearly ore production should amount, in the beginning, to 1.25 million tons.

The rest of the necessary ore will be brought a distance of 2000 kilometers from Magnitnaya Gora by rail until the deposits opened up south of the blast furnace plant are developed to full capacity.

/Table 69/

The ores are bound to lakoliths and to interlined porphyrites and porphyritic tuffs and contain at the most 63 percent Fe, traces of P, 0.10 percent Mn and 0.69 percent S. The smelting works have as a coal base the already mentioned deposit with 450 billion tons in close proximity to the blast furnaces. Manganese ores are found at a short distance (Atlas, page 48).

Russia's output reached a height of 8.8 million tons in 1913, falling below 1 million tons in the first period of the Bolshevik revolution, to reach in the years 1931 to 1938 a production of 28.530 million tons, and this at a time when the rest of Europe, in the first part of the decade, was in the deepest economic depression. Before World War I about one tenth of the total output was exported and 80 to 85 percent of it went to Germany. Exports were at a standstill for many years after the end of the war. Up to the outbreak of World War II, approximately 100,000 tons were exported was reached during only two years; most of the time the exported amount remained at 35,000 to 40,000 tons. This small amount of ore was shipped mostly by sea (Black Sea and Mediterranean, Rotterdam) as the Russian government had prohibited the export of iron ores over the eastern border. At times the ban was lifted; thus, ores also reached Germany by the land route through

Sovnovitse. The ores of central Russia, Siberia and the Urals were not used for export purposes because of their unfavorable location for transportation. The southern Russian regions of Krivoy Rog and Kerch' were the sole providers for export. As a rich autarky, Russia does not need to import ores. In the future Russia will not appear on the European iron ore market as an important buyer as long as it has at its disposal reserves of high grade ores and concentrates in sufficient quantity.

6. CONCLUSIONS

Until now the unusual development of Russian mineral resources has been regarded with much scepticism. However, the 17th International Geological Congress held in Moscow in 1936 has thrown some light on this subject and shown that development has been initiated in Russia to safeguard and utilize the mineral resources on a scale that in the economy of the whole world, during the same period, has been equalled only in Canada. It can be assumed from this development, coupled with the described necessity for opening up its iron ore wealth, that the Soviet Union will eventually reach, but only temporarily, its goal of 100 million tons of iron ore production annually. However, one or two Five-Year Plans will yet be needed and it can be assumed that this great success will not last long, as deep mining and preparation obstruct the unlimited expansion of the iron ore output, and the ore reserves of the Crimean Peninsula, with a quota of 60 million tons out of the 100 million tons future yearly output, are being taxed beyond their production capacity. However, a yearly output of 70 to 75 million tons can be reckoned with for the whole country. Favorable results of the scientific

exploration of North and Central Siberia and the Far East can, for the next decade, have no appreciable influence over the production capacity of the ~~empire~~, because of the wide extent of the land and the lack of transportation routes. The constructive forces of Russian expansion must not be disregarded. The enormous size of the population, the industry of the inhabitants and the great wealth in mineral resources will, after the difficulties described previously have been overcome, cause a surplus of products which one day will be felt on all world markets. In this connection, a first-rate source of energy is the coal reserves of the Soviet Union. They reach, as mentioned, unimaginable figures. In excess of all this wealth in mineral resources, the Soviet Union has incorporated Manchuria in the Far East into its vast empire and by so doing has increased its iron ore possessions considerably. It ~~collected~~ in iron ores more than 3 billion tons in certain and probable reserves, plus more than 1.5 billion tons in possible reserves. The execution of the plan for domestic smelting in the country itself and in the vicinity of the large coal deposit near Fushun was begun by Japan, but its final completeion was interrupted by the war. The Soviet Union will not drop this plan in connection with the opening up of the Far East. Because of its closeness to the countries of the Far East and inasmuch as its incorporation into the Soviet Union has not yet been completed, Manchuria has been dealt with in Chapter II, D3.

Furthermore, it must not be forgotten when examining the Russian economic development that a far-reaching change is taking place in the economic structure of the lands of the Near and Far East while they take their place in the Soviet Grossraum planning and give the Soviet Union first choice in the use of their products and mineral resources for its development.

TABLE 60

THE MORE IMPORTANT IRON ORE RESERVES IN EUROPEAN RUSSIA
(Atlas pages 44 to 47)

Mining regions (1)	Type of Ore (2)	Proved and Probable Reserves (Million Tons) (3)	Possible Reserves (million tons) (4)	Exploitation up to Present and other Remarks (5)
North Russia				
Pudozh ~~Gorsk~~	Magnetite	--	120	--
Olenogorsk at Imandra Lake	Magnetite Martite like Sydvaranger	120	550	Plan to dress 500,000 tons of crude ore annually.
Tik-Guba	Titanomagnetite	--	>100	No rail connection.
Michykov near Murmansk and Enskiy at Kovda Lake	Magnetite	--	670	240 million tons over 40 percent Fe for the projected metallurgical plant near Cherepovets.
Pitkäranta, Valimaki, Kelivaara, Tulmosero	Magnetite	12	89	Mined only recently; at present Titan-magnetite, Skarn.
Gam	Brown Iron Ore	76.4	9.55	Connecting rail line under construction
Moscow Basin				
Kursk	Magnetite, red iron ore	100.4	99.6 (without those of the Anomalies)	Production began in 1939. Ore mine in Korobkovo (20 meter seam) under construction.

(1)	(2)	(3)	(4)	(5)
	Ferriferous quartz	--	860	—
Lipetsk	Brown Iron Ore	71	179	1938 production about 717,000 tons; 2.1 tons of ore = 1 ton pig iron.
Shogr and Kolaych	Brown Iron Ore	184	532	Rail Connection, Voronesh - Saratov.
Tula	Brown Iron Ore and Shaerosiderite	110	113	1932, 182,000 tons; 2.45 tons ore = 1 ton pig iron.
Ural Foreland				
Kutim and Yubrushkin, Bogolovskaye	Brown Ore Magnetite Iron glance	65	35	Blast furnace at Serov.
Vyatka-Vologda-Perm region	Argillaceous Spathic iron ores, partially lumpy and decomposed into brown iron.	21	40	Great superficial spread, limited thickness in sandy-argillaceous layer 4 meters deep - 12 blast furnaces at Kashirsk, Kholunitsk, Omutninsk, Luvinsk.
Urals				
Tagil-Kushvinsk Alapayevsk	Magnetite Brown spar	190.36 66	108.64 134	Dressing required Metallurgical plants located on the ore deposits. Dressing required.
Magnitnaya near Shaytansk -	--	--	>50	—
Sinarsk-Kamensk	--	50	550	Metallurgical plants located right by ore deposits.
Yelizavetinsk	Iron ore, important because of non-ferrous metals	--	37	1934, 500 tons, later 6,000 tons annual production.
Bakalsk	Brown ore of greater purity, combined with limestone.	92.9	45.1	Metallurgical plants located right by ore deposits (Maykorsk Plant)

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(1)	(2)	(3)	(4)	(5)
Magnitnaya-Gora (Magnitogorsk) and Malyy Kuibas	Magnetic, Residual iron pyrites, produced separately	301.5	156.5	Open cut mining, 1.6 tons ore = 1 ton pig iron, 1939- 5.7 million tons, capacity 7.5 million tons. Consumers: Magnitogorsk and Kuznetsk smelting plants.
Beloretsk - Komarovsk	Brown Iron Ore	71.3	182.2	Consumer: Beloretsk iron works.
				See Table 64
Southern Russia				
Khalilovo near ~~Tsekkalov~~ Chkalov	Brown iron ore (Laterite) and brown iron ore (oolite)	66.4	44.7 300	Cr. 1.07 Ni. 0.7
Krivoy Rog and ~~Crimea~~				See Tables 64 and 65
North Trans-Caucasus				
Dashkesan (Azerbaydzhan)	Magnetite	175	15	Mined for a long time. (formerly Siemens)
Malkinsk	Brown Iron Ore with Cr, Ni.	22.9	46	0.5 - 8.68 meter wide oolite beds covered with Jurassic /limestone/ and chalk. Fe from weathered serpentine.
Dagestan	Spathic Iron Ore	unknown	unknown	In the argillaceous layers of the lower Jurassic.
Taman'	Oolitic brown iron ore	unknown	unknown	In the pliocene.

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TABLE 61

COMPOSITION OF THE ORES OF THE DEPOSITS IN EUROPEAN RUSSIA (percent)

Deposits (1)	Fe (2)	Mn (3)	P (4)	SiO_2 (5)	Remarks, Consumer Plants (6)
Northern European Russia					
Pudozhgorsk crude ore	20 - 32	--	--	--	5 - 8 percent TiO_2, 0.28 - 0.4 percent V_2O_5
concentrate	53	--			1 percent V_2O_5
Olenegorsk (Sydvaranger ore type)	35.8	--	traces	40 - 47	Cherepovets Metallurgical Plant, roasted 65 percent Fe, 0.4 percent V_2O_5
Enskiy	30 - 60	--	0.1 - 2.0	--	240 million over 40 percent Fe
Pitkaranta	--	--	--	--	Skarn ores
Tik Guba	48	--	--	--	16 percent TiO_2, Cr, and Ni.
Gam	32 - 41	--	--	--	---
Moscow Basin					
Kursk	50 - 58	--	0.10	5.12	Metallurgical plants: Kosogorskiy, Svobodnyy, Sokol, Novo-Tul'skiy, Novo-Lipetskiy
ferriferous quartzites	35	--	--	--	
Lipetsk	46 - 50	0.13	0.31	10.8	
Angar, brown iron ore	38 - 50	--	0.7 - 2.9	7 - 10	Lipetskiy Plant, projected Kursk plant.
Shigra	40 - 50	--	--	--	
Tula	30 - 40	--	--	20 - 30	
Kulebaki	35 - 42	--	--	--	---

TABLE 61

COMPOSITION OF THE ORES OF THE DEPOSITS IN EUROPEAN RUSSIA (percent)

Deposits (1)	Fe (2)	Mn (3)	P (4)	SiO_2 (5)	Remarks, Consumer Plants (6)
Northern European Russia					
Pudozhgorsk crude ore	20 - 32	--	--	--	5 - 8 percent TiO_2, 0.28 - 0.4 percent V_2O_5
concentrate	53	--			1 percent V_2O_5
Olenogorsk (Sydvaranger ore type)	35.8	--	traces	40 - 47	Cherepovets Metallurgical Plant, roasted 65 percent Fe, 0.4 percent V_2O_5
Enskiy	30 - 60	--	0.1 - 2.0	--	240 million over 40 percent Fe
" Pitkaranta	--	--	--	--	Skarn ores
Tik Guba	48	--	--	--	16 percent TiO_2, Cr, and Ni.
Gam	32 - 41	--	--	--	---
Moscow Basin					
Kursk	50 - 58	--	0.10	5.12	Metallurgical plants: Kosogorskiy, Svobodnyy, Sokol, Novo-Tul'skiy, Novo-Lipetskiy
ferriferous quartzites	35	--	--	--	
Lipetsk	46 - 50	0.13	0.31	10.8	
Khoper, brown iron ore	38 - 50	--	0.7 - 2.9	7 - 10	Lipetskiy Plant, projected Kursk plant.
Zhizdra	40 - 50	--	--	--	
Tula	30 - 40	--	--	20 - 30	
Kulebaki	35 - 42	--	--	--	---

(1)	(2)	(3)	(4)	(5)	(6)
Ural Foreland					
Kutimsk	50 - 65	--	--	--	Serovsky Metallurgical Plant
Yubrushkin	30 - 40	--	--	--	
Vyatka-Vologda-Perm	30 - 35	--	0.05	14 - 28	Roasted Al_2O_3; 3 - 19 percent S; 0.22 percent
Urals					
(see table 62)					
Southern Russia					
(see also table 63)					
Khalilovo, magnetite	66.4	0.04	0.39	1.62	TiO_2, 0.08; Al_2O_3, 0.74; H_2O, 1.30; Ni, 0.06; CaO plus MgO, 0.68 percent
Khalilovo, laterite	38 - 45	0.29	0.015 - 0.8	10.32 - 22	Orsk Metallurgical Plant, Al_2O_3 12 - 15, Cr 1.07, Ni 0.7, V, T, S, to 1 percent.
Caucasus					
Dashkesan	55	--	0.60	2.5 - 10	Projected plant in Transcaucasus 0.1 - 0.6 percent S, traces of Cr.
Malkinsk, laterite	---	--	--	--	Brown iron ores with V.
Malkinsk, oolitic	36.45	traces	Ni 0.32	Ni 1.61	Projected plant in Northern Caucasus
Malkinsk, bulky	12.60	traces	Cr. 0.30	Cr 0.60	

TABLE 62

TION OF THE IRON ORES OF THE URAL DEPOSITS
(in percent) (Atlas pages 44 and 45)

Al_2O_3 (8)	CaO (9)	MgO (10)	S (11)	Consumer Plants (12)
--	--	--	--	Evelovsk
				Kutinsk
				Palatinsk
--	--	Cu 0.2	0.04 - 0.10	3 metallurgical plants and the Serovskiy Plant
--	--	--	traces	Concentrated to 65 percent
--	--	--	< 0.12	Kiselovsk, Chernoistok
--	--	--	traces	Palatinsk
1 - 9	--	--	--	Lysvinsk, Kursye
--	--	--	--	Bizersk, Tyeplogorsk
--	--	--	--	Kushvinsk, Pervouralsk, Nizhnyaya Tura
5 - 6.7	1.05 - 11.71	0.08 - 0.61	traces	Verkhnye, and others. TiO_2 - 0.2 - 1.0 percent
--	--	--	--	contains titanium
6 - 4.8	0.9 - 2.2	0.6 - 0.9	0.02 - 0.3	Novo Tagilsk, Magnitogorsk 7 metallurgical plants

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TABLE 62

COMPOSITION OF THE IRON ORES OF THE URAL DEPOSITS
(in percent) (Atlas pages 11 and

Ural (1)	District (2)	Type of Ore (3)	Fe (4)	Mn (5)	P (6)	SiO_2 (7)	Al_2O_3 (8)	CaO (9)	MgO (10)
North Urals	Cherdynsk	magnetite	60	--	--	--	--	--	--
		hematite							
		brown iron ore							
	Bogoslovsk	magnetite	55 - 63	--	0.1	--	--	--	Cu
Central Urals	Elagodat'	magnetite	35 - 65	--	traces	--	--	--	--
	Kiselovsk	brown iron ore	46 - 57	--	<0.12	9 - 10	--	--	--
	Vysokaya	red iron ore	45 - 60	--	traces	--	--	--	--
		magnetite							
	Lyalinsk	brown iron ore	40 - 58	0.1 - 5.0	0.2 - 0.5	9 - 26	1 - 9	--	--
	Lyalinsk	oölitic	66	--	up to 0.7	--	--	--	--
	Gora Blagodat' Goroblago-dask	magnetite	20 - 25	--	--	--	--	--	--
	Goroblagodat'	magnetite	42 - 63	0.3 - 1.0	0.007 - 0.2	4 - 21	2.5 - 6.7	1.05 - 11.71	0.08 - 0.
	Kusa	magnetite	31 - 52	--	--	--	--	--	--
	Nizhniy-Tagil'sk	magnetite	51 - 56	0.2 - 0.9	0.0 - 0.08	5 - 18.3	1.6 - 4.8	0.9 - 2.2	0.6 - 0.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Kamensk	brown iron ore	30 - 39	--	--	21 - 34	--	--	--
	Alapayevsk	brown iron ore	43 - 49	0.1 - 0.4	0.13	6 - 23.6	2.6 - 12	0.1 - 1.0	0.2 - 0.7
	concentrate								
	crude ore		25 - 42	--	0.50	20	--	--	--
	Nevyansk	magnetite	53 - 64	0.1 - 0.2	0.17 - 0.22	3.3 - 7.1	1.6 - 3.5	0.5 - 1.3	0.2 - 0.3
	Iset'sk	brown iron ore	46 - 50	--	--	--	--	--	--
	Shaytansk	magnetite	--	--	--	--	--	--	--
	(Magnitnaya - Gora)								
	Ilmovskoye	hematite	49 - 57	<1	<0.2	14 - 27	--	--	--
		magnetite							
	Satkinsk	magnetite	51 - 58	0.5	up to 1	2 -12	--	--	--
	Bilimbayevsk	brown iron ore	46 -53	<1	0.2 - 0.4	12 - 20	--	--	--
	Serginsk	dressed brown iron ore	40 - 50	--	--	--	--	--	--
	Ufaleysk	limonite	49 - 53	0.2	0.3 - 0.5	>10	--	--	--

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(8)	(9)	(10)	(11)	(12)
--	--	--	--	V 0.4 - 0.6
2.6 - 12	0.1 - 4.0	0.2 - 0.7	H_2O	Alapayevsk,
			0.7 - 2.1	Irbitsk, and others
--	--	--	--	
1.6 - 3.5	0.5 - 1.3	0.2 - 0.3	0.03	Nevyansk, contains titanium
--	--	--	--	7 small plants
--	--	--	--	TiO_2 up to 5 percent
--	--	--	--	--
--	--	--	--	--
--	--	--	--	Kuvinsk
--	--	--	--	Verkhne, N. Serginsky N.
--	--	--	--	Ufaleysk, Artinsk, and others

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(1)	(2)	(3)	(4)	(5)	(6)	(7)	
South Urals	Zlatoust	magnetite	35	--	--	--	
	Magnitka	magnetite	53 - 65	--	--	--	
	Kusa	magnetite	43 - 50.6	--	--	12 - 29	
	Bakal	crude ore	29 - 36	0.8 - 1.9	0.001 - 0.006	0.4 - 3.3	0.
	Bakal, concentrate	brown iron ore	55.23	1.7	0.023	9.8	
	Ivanovsk	--	57.64	2.1	--	3.2	
	Magnitnaya-Gora	magnetite	56	0.80	--	14.85	
			60	--	--	6.11	
		hematite	65	traces	--	0.81	
		hematite	58	0.35	--	11.06	
		brown iron ore	53	5.30	--	3.91	
		hematite	46	0.64	--	23.45	

(9)	(10)	(11)	(12)
--	--	--	Satka Satinsk, Zlatoust
--	--	--	Kus[illegible], Mi[illegible]ss
--	--	--	TiO_2 5 - 6
traces to 3.2	6.5 - 10.7	traces	13 million tons produced until 1936, spathic layer 60 - 70 meters thick
1.02	1.84	0.006	smeltingplants projected
--	--	--	--
1.82	--	--	Magnitogorsk Plant and Stalino (Kuznetsk)
2.39	--	--	
traces	--	--	
--	--	0.93	
--	--	--	
0.20	--	--	

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TABLE 63

AVERAGE CLASSIFICATION OF THE WORKABLE UKRAINIAN IRON AND MANGANESE ORES

Ore (1)	Composition in Dry State (in percent) Fe (2)	Mn (3)	P (4)	SiO_2 (5)	Al_2O_3 (6)	CaO (7)	MgO (8)	S (9)	As (10)	V (11)	Loss on ignition (12)	Residue (13)	Remarks (14)
1. Krivoy Rog:													
Magnetite													
(Zheltaya Reka)													Humidity 3 - 5 percent
Type I	64.62	0.27	0.019	4.27	1.07	0.45	0.21	0.032	--	--	1.6	--	
	61	0.2	0.05	9.0	0.1	0.7	0.04	0.02	--	--	0.4	1.04 - 5.92	Freeze up in winter
Type II	55-58	0.08-0.45	0.25-0.05	2-14	0.13-2.6	0.64-2.98	--	trace	--	--	--	1.04 - 5.92	
Martite ores	64.00	0.06	0.03	5.50	0.80	0.30	0.10	--	--	--	--	1.60	Metallurgical plants in the south Russian iron industry area as well as foreign consumers.
Red iron ore (Sakagan' seam)	64.5	0.04	0.03	5.70	2.20	0.02	0.1	--	--	--	1.2	1.04 - 5.92	
Brown Iron ore	60 - 55	--	0.03	7.50	--	--	--	--	--	--	--	1.04 - 5.92	
2. Kerch' iron ores:													
Average	38-43	0.5 - 4.5	0.45-1.3	13-17	3-6	1-2	0.5	10.5-0.15	0.10-0.15	0.003	10-15	--	Lykov, Azovstal', metallurgical plants. New projected plant near Kerch'. Fineness 80 - 90 percent Moisture 18 - 25 percent.
Brown iron ore	36-40	1.25	0.95	13-15	4-6	--	--	0.20	0.08	--	--	--	
Black iron ore	34-36	4.50	1.00	13-15	4-6	--	--	0.20	0.08	0.04-0.09	--	--	
Briquettes	47	2.5	1.95	15-16	--	--	--	0.04	0.07	--	--	--	

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
3. Nikopol'													
Manganese ores:													
Type I	1.9	48.3	0.2	10.5	1.4	1.10	0.80	0.1	trace	--	13.1	—	
Type II	2.3	42.0	0.2	13.6	2.1	3.40	0.50	trace	--	--	14.5	—	
Crude ore	3.45	30.2	0.17	29.10	4.32	2.60	2.24	0.02	1.0	0.0	19.9		

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TABLE 64

IRON AND MANGANESE ORE RESERVES OF THE UKRAINE
(million tons)

Ore Regions	Proved and Probable Reserves	Iron Content	Possible Reserves	Iron Content	Total	Iron Content
Krivoy Rog	669	401	1670	585	2,340	985
Ferriferous quartzites	--	--	--	--	10,500	4,200
Nikolayev	10	4.5	--	--	10	4.5
Kerch' (Table 65)	1,655	573	1,085	334	2,740	907
Nikopol' with	Mn ore	Mn	Mn ore	Mn	Mn ore	Mn
Aleksandrovsk	90	27	401	120	491	147

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TABLE 65

RESERVES AND COMPOSITION OF THE IRON ORES OF THE CRIMEAN PENINSULA (KERCH')

	Basins	Average Iron Content (percent)	Average Thickness of Ore Layers (meters)	Reserves (million tons)	
Certain Reserves	Eltigen-Ortel'sk	34.3	9.4	150.6	
	Kamysh-Burunsk	34.3	7.7	126.0	
	Kys-Aulyysk	33.1	10.0	212.6	
	Kerch' ore field	36.9	--	21.4	
	Nasyr field	35.2	--	14.0	
	Bagerovo-Skasev	28.0	--	29.6	
	Chegene-Zoagynsk	36.7	6.2	241.8	1096.0
Probable Reserves	Kys-Aulyysk	32.3	10.0	95.0	
	Nasyr field	32.0	--	10.0	
	Bagerovo-Skasev	--	--	18.0	
	Kaerles field	34.2	--	263.6	
	Akmanay field	34.3	--	24.4	
	Kiten field	34.4	--	7.8	
	Baksin basin	--	--	57.2	
	Kiyat field	31.9	--	14.0	
	Kresnokut	31.4	--	13.0	
	Kesen basin	31.0	--	26.0	559.0
Total certain and probable reserves					1655.0
Possible reserves					1084.0
Total reserves					2739.0

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TABLE 66

RESERVES AND COMPOSITION OF ORES OF THE ASIATIC DEPOSITS OF THE SOVIET UNION
(million tons)

Deposit Region (1)	Kind of Ore (2)	Proved and Probable Reserves (3)	Potential Reserves (4)	Iron Content (5)	Consumer Plants and other Remarks (6)
Kazakhstan and Russian Central Asia					
Karkaralinsk	magnetite	9.9	30.2	50 - 69	Projected smelting plant in Kazakhstan at Dzhezkazgan near South Siberian Railway.
Atasuyskiy	magnetite	--	39.6	41 - 63	
Kentyube	iron glance	9.0	38.0	50 - 55	
Chetskiy	magnetite	--	9.0	--	--
Karsakray	magnetite	0.9	6.2	46 - 55	Flux for copper smelting plant in Karsakpay. New iron smelting plant in Tbilisi.
Karsakpay	martite ferriferous quartzite	--	100.0	34 - 50	
Other deposits in Karaganda region	--	--	5.2	--	Including Kirgiziya and Uzbekistan; high and inaccessible mountain locations.
Additional deposits in Kazakhstan region	--	0.2	6.1	--	--

(1)	(2)	(3)	(4)	(5)	(6)
West Siberia					
Tel'bes Group					
Temir-Tau	magnetite	9.9	4.4	35 - 59	The deposits cover 15 percent of the Kuznetsk Smelting Plant consumption.
Odra-Bash	magnetite	9.9	--	24 - 43	Kuznetsk Smelting Plant. Dressing in Mundybash.
Additional mines (Tel'bes)	magnetite	--	3.6	--	Contact formations with Devonian eruptive rock. In Shoriyan Mountains up to 0.4 percent Zn.
Kondomskaya Group					
Sheregesh	magnetite	3.2	35.5	26 - 54	Kuznetsk Smelting Plant.
Kochura	magnetite	0.5	4.6	41 - 50	Kuznetsk Smelting Plant
Tashtagol	magnetite	25.3	8.1	50.8	The most important deposits have the least Zn content.
Mundybash	magnetite	2.0	--	--	
Shalym	magnetite	4.9	17.6	30 - 55	--
Tashelginskaya Group	magnetite	9.9	4.7	20 - 68	--
Teyskaya Group	magnetite	--	8 .3	28 - 48	--
Abakan (Zyda)	magnetite	44.8	60.0	20 - 60	Still without railway connection.
East Siberia					
Krasnoyarsk-Kansk Group	limonite siderite	10.0	20.4	24 - 60	Without railway connection, 44 kilometers long, up to 60 percent Fe.

(1)	(2)	(3)	(4)	(5)	(6)
Irbinsk Group	magnetite	2.3	30.3	35 - 62	(Irbin) still without railway connection.
Additional deposits	--	0.6	80.9	--	Still without railway connections.
Irkutsk					
Zonovyy Bayts	ferriferous quartzite	--	100.0	27 - 48	10 ore sites with thickness of 80 meters.
Ilimsk Group					
Rudna-Gora (Zedan,	magnetite	52.9	176.0	53.6	(Verchinsk) still without railway connection.
Kechma, Bratsk)			108.0	40.0	Still without rail connection.
Korshunovsk	magnetite	--	10.5	--	Still without rail connection.
Additional deposits	--	--			
Kurba Basin					
Mukhor	Ferriferous quartzite	--	200.0	--	100 kilometers north of the Trans-Siberian Railway, still without rail connection
Myldygen	magnetite				
Argun Group					
Zheleznyy Krask	magnetite	--	100.0	55 - 66	150 kilometers from Trans-Siberian railway.
Berezovsk	magnetite	--	75.0	40 - 50	--
Additional deposits	--	--	5.17	--	--

(1)	(2)	(3)	(4)	(5)	(6)
Verkhne-Udinsk /Ulan-Ude/ Group					
Balegayinsk	magnetite	2.4	1.1	47.75	Petrovsk-Zabaykalskiy Smelting Plant
Myskovsk	magnetite				
	fayalite	0.38	--	42.33	Skarn
Undur-Khozur	magnetite hematite	unknown	--	23 - 51	Table 66a
Lena Group					
Batominsk	brown iron ore	--	100.0	37	On the Lena River
Far Eastern Area					
Belogorsk	magnetite	0.6	6.1	34.9	Olga area, Amurstal' Smelting Plant; permeated with heavy metals.
Lestvinichnyy	magnetite	--	60.0	--	--
Sergeyevsk	--	0.2	0.1	46.7 Concentrate	--
Little Khingan	Ferriferous quartzite iron and magnesia mica	--	500.0	50 - 60	Amurstal' Smelting Plant
Nikolayevsk	brown iron ore	14.2	9.5	26 - 48	Amurstal' Smelting Plant
Ussuri kray	ferriferous quartzite	--	90.0	--	Talovs-Kipovskoye
Additional deposits	--	--	2.9	--	--
Total Asiatic Russia		214.4	2358.9		
Manchuria (See Also II, D 3)	hematite	3000.0	1500.0	35 - 36	90 percent of the amount has over 30 percent Fe.

TABLE 66a

COMPOSITION OF THE ORES OF INDIVIDUAL MINING DISTRICTS IN EAST SIBERIA (in percent)

Kind of Ore	Fe.	Mn	P	SiO_2	Al_2O_3	CaO	MgO	S	Loss on Ignition
Central Siberial Lowland									
Minusinsk Group	Magnetite Hematite Skarn 61.33	trace	trace	7.96	---	0.52	trace	0.56	2.26
Minusinsk Group	Skarn 68.54	trace	trace	6.50	---	0.15	--	0.18	1.50
Minusinsk Group	Skarn 55.21	--	trace	11.03	--	3.18	--	0.45	6.00
Il'm Group									
Zedan Deposit	Skarn 30.66	--	--	22.09	--	--	--	--	--
	Skarn 66.71	--	0.9 - 0.20	--	--	--	--	trace	--
Kezhma Deposit	-- 58 -59	--	--	--	--	--	--	--	CO_2
Krasnoyarsk	-- 56.22	0.84	--	5.49	1.15	5.22	0.32	0.16	7.25
	48.01	0.33	0.03	7.27	2.10	6.14	6.49	--	10.15
Dolonosvsk	-- 50 - 58	--	0.44-0.88	--	--	--	--	--	--
Yermakovsk	Magnetite and hematite with Apatite 55-60	--	--	--	--	--	--	--	--
Irkutsk Group									
Sos Zaymovyy-Bayts (Onok region)	Hematite Magnetite 35.74	--	trace	49.21	--	--	trace	0.14	0.88
	33.42	--	trace	52.46	--	--	trace	trace	0.54
	33.75	--	trace	52.9	--	--	trace	trace	0.54

RESTRICTED

RESTRICTED

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Ol'khonsk region										
Naryn-Elgin	Limonite	54.67	--	trace	7.56	--	--	--	--	--
Tumyrbash-Borzoy	Limonite	55.13	0.54	0.450	4.10	1.46	0.85	0.62	--	10.37
	Limonite	45 - 55	--	--	--	--	--	--	--	--
Western Trans-Baykal										
Myasovsk	Magnetite and Fayalite	42.33	--	0.38	35.94	--	--	--	0.10	--
Undur-Khozur	Magnetite									
	Hematite	37.55	0.72	0.211	41.49	1.37	1.53	1.23	0.31	--
Balegayinsk	Magnetite	45.75	--	0.04	--	--	--	--	0.19	--
Kurba Region										
Balgabar	Hematite	59.80	--	trace	13.31	0.66	0.16	0.25	0.13	0.04
	Iron glance	42.08	--	0.01	36.00	2.30	0.21	0.48	0.13	1.26
		37.43	--	--	41.79	3.25	0.43	0.63	0.15	0.74
		31.72	--	0.60	42.50	4.32	3.80	1.30	0.02	3.59
East Trans-Caucasus										
Bystrinsk	Skarn	45-60	--	--	--	--	--	--	--	--
Iron Mountain	--	60.84	--	0.05-0.06	--	--	--	--	--	--
Sediments	Siderite	39.70	--	--	--	--	--	--	--	--

TABLE 67

KNOWN IRON ORE RESERVES OF THE SOVIET UNION IN 1935
million tons (without ferriferous quartzites)

Areas	Proved and Probable Reserves	Possible Reserves	Total Reserves
North Russia	208	1,619	1,827
Central Russia	465	924	1,389
Ural region and foreland[1]	758	1,388	2,146
Ukraine and Crimea	2,354	2,755	5,109
North Caucasus and Transcaucasia	264	426	690
European part of the Soviet Union (Atlas page 44)	4,049	7,112	11,161
Kazakhstan and Russian Central Asia	11	98	109
West Siberia	111	303	414
East Siberia and Yakut ASSR	174	737	911
Far East	18	662	680
Asiatic part of the Soviet Union (Atlas page 46)	314	1,800	2,114
Total iron ores	4,363	8,912	13,275

1/ The entire Ural region has here been included in Europe, although the boundary between Europe and Asia in the North and Central Urals follows the points of highest elevation, thus causing part of the Urals to lie in Asia. Here the high grade iron ores are beginning to be exhausted; 11 million tons of low grade ores already lie in waste dumps.

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TABLE 68

THE POSSIBLE TOTAL RESERVES OF FERRIFEROUS QUARTZITES OF THE SOVIET UNION

(in million tons) (according to Bonwetsch)

Regions	Proved and Probable reserves but at present not yet worth mining	Uncertain Inferred Reserves	Total Reserves
Murmansk region	106.9	424.3	531.2
Kursk Magnetic Anomaly	858.5	202,896.0	203,754.5
Krivoy Rog without Anomaly	10,672.0	40,672.0	51,344.0
Karsakpay (Kazakhstan)	--	--	64.5
Zydrinsk deposit (Krasnoyarsk region)	--	--	29.1
Onon district (Irtysh region)	--	--	97.8
Kurbinsk region (Buryat-Mongol ASSR)	9.1	203.8	212.9
Khingan district and Ussuri region (Far East)	41.2	604.9	646.1
Ferriferous quartzites, total:	11,687.7	244,791.0	256,670.1

TABLE 6

IRON ORE OUTPUT AND PIG IRON PRODUCTION OF RUSSIA

(in 1000 tons)

Year	Iron ore	Pig iron	Year	Iron ore	Pig iron	Year	Iron ore	Pig iron	Year	Iron ore	Pig iron
1860	750	235	1917	4,500	3,119	1929	7,146	4,321	1941	22,712	12,000
1870	80	360	1918	1,340	2,690	1930	10,225	5,017	1942	--(1)	8,000
1880	1,064	419	1919	900	900	1931	10,612	4,871	1943	--	10,000
1890	1,796	928	1920	160	101	1932	12,154	6,141	1944	--	12,500
1900	6,107	2,901	1921	153	111	1933	15,100	7,133	1945	14,000	15,400
1910	5,758	3,042	1922	177	117	1934	21,823	10,195	1946	--	17,200
1911	6,998	3,593	1923	430	330	1935	27,042	12,413	1947	--	16,000
1912	8,209	4,267	1924	947	757	1936	27,917	14,093	1948	--	11,500
1913	8,810	4,635	1925	2,083	1,551	1937	26,400	14,550	1949	--	16,000
1914	6,300	4,316	1926	3,317	2,954	1938	28,530	14,600	1950	--	19,500
1915	5,700	3,792	1927	4,813	3,650	1939	--	15,240			
1916	6,500	3,901	1928	5,814	3,375	1940	27,500	14,950			

(1) In 1937 in Russia there were 11 sintering plants for 4.5 million tons of iron ore and 115 blast furnaces.

TABLE 49 (Continued)

RUSSIAN IRON ORE EXPORTS TO GERMANY

(in 1000 tons)

Year		Year		Year	
1906	238	1912	555	1925	30
1907	614	1913	409	1926	94
1908	528	1914 - 21	--	1927	99
1909	552	1922	7	1928	67
1910	779	1923	36	1929	36
1911	690	1924	1	1930(1)	39

(1) The data for later years are not available.

TABLE 69 (Continued)

DEVELOPMENT OF PRODUCTION IN CERTAIN MINING REGIONS OF THE SOVIET UNION

Mining Region	1913		1929		1933		1938		1940	
	1000 tons	percent	1000 tons	percent	1000 tons	percent	1000 tons	percent	1000 tons	percent
Central Russia	564.3	6.1	534.8	6.7	717.8	5.0	1,388.2	5.2	--	--
Urals	1778.0	19.4	1762.7	22.0	4,256.6	29.4	7,729.1	29.2	--	--
Siberia	3.2	--	8.8	0.1	206.5	1.4	490.4	1.8	--	--
Crimea (Kerch')	480.0	5.2	91.[illegible]	1.2	282.1	2.0	852.1	3.2	--	--
Ukraine (Krivoy Rog)	6,388.0	69.2	5,599.0	70.0	8,991.6	62.2	16,069.9	60.6	19,000[1]	--
Total:	9,213.5	100	7,997.1	100	14,454.6	100	26,529.7	100	--	--

[1] This does not exhaust the estimated capacity. 100 million tons of iron ore and 50 to 60 million tons of pig iron are planned for 1960.

TABLE 69 (Continued)

RUSSIAN ORE EXPORTS
(in 1000 tons)

1911	886	1929	545	1933	0.4	1937	383
1912	663	1930	467	1934	26	1949(1)	800
1927	406	1931	1119	1935	131		
1928	480	1932	1	1936	213		

(1) In 1949 Soviet Russia exported 800,000 tons to Czechoslovakia.